

**MARK SCHEME for the May/June 2008 question paper**

**9696 GEOGRAPHY**

**9696/02**

Paper 2 (Physical Geography), maximum raw mark 50

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All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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## Tropical environments

- 1 (a) With the help of a diagram, describe the vegetation structure of the tropical rainforest. [10]**

Structure is the spatial organisation of the TRF and candidates should show a layered pattern in a diagram. At the top is the emergent canopy 50 m in height, a discontinuous layer of mature trees. The canopy contains a saprophytic plant community. The trees are buttress rooted with umbrella shaped crowns. Middle canopy (20-30m in height) mop-shaped crowns, rich in foliage and fruit with lianas. Lower canopy – densely packed conical shaped trees. Shrub canopy – 5m discontinuous with palms, banana and ferns – filtered sunlight adaptations. Ground cover is sparse due to lack of sunlight. Much can be achieved by a decently annotated diagram.

- (b) To what extent is it possible to identify a tropical climate? [15]**

Apart from their existence between 30°N and S and generally high temperatures, there is a great variety of climates within tropical areas. These vary from equatorial climates, monsoonal, seasonally humid, semi-arid and arid climates. Some might designate them by biomes i.e. TRF, savanna, semi-arid and desert, which is acceptable. Allow candidates to define a single tropical climate if given in some detail.

### Candidates will probably:

#### **L3 12–15**

Show an awareness of the basic characteristics of the range of climates within the tropics. These need only be descriptive, but could contain useful exemplification. The main ranges should be covered although both arid and semi-arid may be put together. The variety will be the basic answer, although there will be some awareness of the overall tropical parameters e.g. high amounts of insolation.

#### **L2 7–11**

Show an awareness that there is a range of climatic types within the tropics, although this will be seen in rather broad categories i.e. humid, monsoonal seasonally humid etc. There will be less detail regarding their different characteristics and little exemplification.

#### **L1 0–6**

Make vague references to hot, wet climates and ones that are less wet seasonally. Monsoon climates may be mentioned but with little accuracy. Some may just refer to a vaguely tropical climate that is hot and wet, which should receive only limited credit.

**[Total: 25]**

- 2 (a) Fig. 1 shows the nutrient cycle of the Tropical Rainforest. With reference to Fig.1, explain why the biomass is the largest nutrient store. [10]**

The nutrient flows are large and relatively rapid due to the temperatures and precipitation. The biomass is the main store reflects the large scale nature of the vegetation and the rapidity of decomposition at the surface. Thus nutrients remain trapped in the biomass until the trees die or are cleared. The litter and soil stores are small as much organic matter has decomposed before reaching the floor. In the soil nutrients are taken up by the plants or are lost to leaching

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- (b) To what extent have both erosion and weathering contributed to the development of granite landforms in the humid and sub-humid tropics? [15]**

Clearly both have made contributions but it can be argued that deep weathering has had a decisive influence, with erosion contributing to the stripping processes of etchplanation. Pediplanation could be seen to give a greater role to erosion.

**Candidates will probably:**

**L3 12–15**

Give answers which will reflect the roles of weathering along basal surfaces in the production of many landforms such as inselbergs, koppies, tors etc. Erosion will be seen as impacting upon regoliths to produce emerged landforms. Some may even see a role for climatic change although this is not necessary for the marks.

**L2 7–11**

Give more an account of the production of landforms in the humid tropics, e.g. inselbergs. There will be an awareness of the role of chemical weathering and some suggestion of erosion in etchplanation. The focus will be on the final landforms rather than the processes.

**L1 0–6**

Give a rather vague account of some tropical landforms. The precise role of deep weathering will not be appreciated although mentioned and erosion will be seen only as a modifying feature, if it finds mention at all.

**[Total: 25]**

**Coastal environments**

- 3 (a) Outline the contribution of wave refraction and longshore drift to coastal deposition. [10]**

Diagrams can be effective in this question. LSD will be seen as a combination of littoral or beach drift and longshore currents to produce the familiar zig-zag movement of sediment along coasts. Where the current slackens then sediment is deposited. Refraction has a role to play in this, although many will see this as only a means of reshaping sediment e.g. in recurves.

- (b) Explain and assess the theories concerning the formation of coral atolls. [15]**

Seemingly straightforward, but most find the explanation of even theories such as the Darwinian evolution of atolls something of a challenge. Clearly fringing and barrier reefs should be included and there should be some grasp of the conditions necessary for coral growth in order to comprehend the significance of sea level change.

**Candidates will probably:**

**L3 12–15**

Feature prominently the Darwinian sequence in their answer, but there will be some appreciation of alternative theories (e.g. Daly). The assessment part will probably be limited to a comparison of the theories, rather than comparisons of the relative flatness of lagoons (Daly).

**L2 7–11**

Describe the Darwinian (or other) sequence with some accuracy probably in diagrams. The level of understanding will be more limited and there might be only vague or no references to alternative theories.

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**L1 0–6**

Give some description of fringing, barrier reefs and atolls, but there will be little comprehension of their evolution. These answers will be characterised by rather crude and inaccurate diagrams and little comprehension of the influence of sea level change.

[Total: 25]

**4 Fig. 2 shows some processes operating on cliffs in a temperate location.**

**(a) Explain the processes that are affecting the cliffs shown on Fig. 2. [10]**

The processes shown are the saturation of the cliff by groundwater from percolating rainfall leading to large scale rotational slumping. The cliff slope fails along a glide plane. The processes of marine erosion and longshore transportation then act upon the toe of the slump. The other example is produced by direct undercutting of the cliff face by marine erosion (hydraulic, quarrying etc) and the removal of the undercut material by transportation. This then allows the cliff to slump along lines of weakness exploited by sub-aerial weathering.

**(b) Describe and evaluate the success of methods that might be employed to protect coastlines. [15]**

The methods involve mainly that of hard engineering in protecting the cliff base from erosion and removal of material. Gabions sea walls etc. Action can be taken at the cliff top to restrict the impact of sub-aerial weathering (e.g. Barton-on-Sea). Attempts to retain a protective beach by the use of groynes. Other management could be in the form of managed retreat. Most hard engineering solutions are expensive and of limited long term effect. Interference with sediment cells (groynes) can merely shift the problems elsewhere. Some candidates may deal with the threats posed by pollution, particularly on coral coasts and attempt to evaluate methods to overcome this.

**Candidates will probably:**

**L3 12–15**

Give an appropriate range of protective measures with some critical appraisal and even exemplification. Some selectivity will be shown to match the conditions shown in the diagrams.

**L2 7–11**

Make rather an indiscriminating description of coastal protection measures with a strong emphasis on hard engineering. The critical assessment will probably be limited to cost rather than effectiveness.

**L1 0–6**

Provide generalised accounts of some measures of coastal protection. Groynes will no doubt feature prominently and there will no, or very little appreciation of their limitations.

[Total: 25]

**Hazardous environments**

**5 (a) Using diagrams, explain how tropical storms (hurricanes) are produced. [10]**

They occur in tropical seas where sea temperatures are greater than 27°C. They are found 10-15°N and S of the equator, where a reasonably large coriolis force allows the developed

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of an organised circulation pattern. This produces an intense cyclonic vortex with rapid uplift, high speed surface winds, intense rainfall and a calm eye. They are asymmetrical in the direction of travel and can move at high speeds. They tend to die out over land once the warm ocean energy source has been removed.

- (b) Explain where tropical storms (hurricanes) are most frequently hazardous and, using examples, describe the nature of the hazards that they produce. [15]**

Clearly 10-15°N and S of the equator, although they will move polewards from these areas. Islands of the Caribbean and shallow coasts such as Florida and Bangladesh will see their impact magnified. Their hazardous effects are magnified in LEDCs due to their inability to predict and cope. The hazardous effects are direct through high winds and rainfall and less direct through flooding and landslides.

**Candidates will probably:**

**L3 12–15**

Make good use of exemplification, with accounts often derived from actual events. Hence such events as New Orleans can be used to telling effect. Good balance between direct and indirect hazards including disease etc consequent upon flooding.

**L2 7–11**

Give a more generalised account of the impact of hurricanes, with individual examples cited as areas most at risk. The effects will concentrate on the direct results of high winds and rain with some example drawn from actual occurrences.

**L1 0–6**

Give very vague accounts of the impact of hurricanes, with little appreciation of the distribution of the hazards. Effects will be limited to the destruction of property and the disruption of services.

**[Total: 25]**

- 6 (a) Fig. 3 shows the volcanoes that form a continental volcanic arc in the Cascade range of North America. Explain how such volcanoes are formed. [10]**

The diagram shows a collision tectonic margin where active subduction is occurring. As the continental plate is subducted, magma from the Benioff zone is forced to the surface through faults and jointing systems to produce a volcanic arc. Diagrams could be used effectively.

- (b) Describe the types of hazardous materials produced by volcanic eruptions. Using examples, explain the effects that these erupted materials can have upon the human occupation of areas surrounding volcanoes. [15]**

The range of hazardous materials encompasses lava, pyroclastic flows, ash, tephra, etc particularly when accompanied by explosive eruptions. Some distinction could be made between explosive volcanoes (e.g. Vesuvius) and more gentle eruptions (e.g. Etna) in terms of impact upon surrounding areas.

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**Candidates will probably:**

**L3 12–15**

Give a good description of erupted materials and use of exemplification to demonstrate their hazardous effects. Although Mt St Helens did not result in great loss of life, it could well be used to illustrate the devastating landscape impact that eruptions can have.

**L2 7–11**

Provide a descriptive coverage of erupted material although these will not always be well linked to their hazardous nature. Exemplification will probably be along the lines of 'e.g. Mount St Helens'.

**L1 0–6**

Give a partial account of erupted materials concentrating on lava flows. Some examples may be cited of hazardous effects although more attention may be devoted to efforts to ameliorate/divert their impact.

**[Total: 25]**

**Arid and semi-arid environments**

**7 (a) Giving examples, explain why arid areas are arid. [10]**

Those areas with less than 250mm of rainfall are due to the climatic conditions induced by descending sub tropical air, rain shadow effects, cold currents and continentality. Examples should be given of deserts that result from each of these.

**(b) Explain how vegetation in arid and semi-arid areas has adapted to these environments. [15]**

Vegetation demonstrates a number of adaptations to cope with aridity and high temperatures. They also have to contend with shallow and alkaline soils. Thus the adaptations include widespread or deep rooting to maximise water gathering. Waxy leaves thorns etc to reduce transpiration. Water storage (baobab) particularly in semi-arid areas. Long periods of seed storage before germination and fire climax are all possible variants that can be developed.

**Candidates will probably:**

**L3 12–15**

Provide good coverage of variations linked to all aspects of arid environments i.e. a recognition of temperature, evapotranspiration, soils, winds etc as well as aridity. Good exemplification.

**L2 7–11**

Show a more narrow concentration on the adaptations to aridity although some useful examples will often be employed.

**L1 0–6**

Give only lack of water and that seen largely through the existence of such plants as cacti. No real attempt to relate vegetation to environment. More a description of some desert vegetation types.

**[Total: 25]**

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- 8 (a) Figs. 4A and 4B show the hydrological response to rainfall in arid areas. Explain how the nature of rainfall in arid areas affects stores and flows within the hydrological system. [10]

Rainfall is episodic and intense which leads to low rates of interception due to lack of vegetation, similarly for stem flow etc. Due to precipitation intensity exceeding infiltration capacity, infiltration rates are low as is percolation. Runoff is generally swift, although temporary surface stores could be created in flat areas. Runoff is also increased due to the emulsification of the dry sandy surfaces. Throughflow and groundwater stores are low as is base flow. This is reflected in channel flow as shown by the flashy response of the hydrographs.

- (b) Describe and evaluate one or more schemes that promote sustainable development of arid or semi-arid areas. [15]

An opportunity to develop a case study or examples of desert development schemes. Most will probably involve irrigation and the accounts should be able to assess not only the cost/benefit of such schemes but also make some assessment of sustainability.

**Candidates will probably:**

**L3 12–15**

Display an awareness of the nature of sustainable development and be able to apply it to the case study or examples chosen. The nature of such schemes will be described and their levels of success and sustainability evaluated.

**L2 7–11**

Be stronger on the description of the schemes than on any concept of sustainability. The projects will be effectively described although any evaluation will be of limited scope.

**L1 0–6**

Describe schemes which are more generic than specific ('irrigation from the damming of rivers e.g. Aswan Dam'). The effects of such schemes will vague and there will be little attempt at any form of evaluation.

**[Total: 25]**